Claims

1. A fine grained sintered cemented carbide containing chromium, comprising a first phase based on tungsten carbide which is bound by means of a second phase of a metallic binder based on Co or CoNiFe, and of at least one additional phase comprising at least one carbide or mixed carbide of tantalum,

- the sintered cemented carbide contains approximately 0.3 to 4 % Ta, as related to the total mass of the sintered cemented carbide,
- the tungsten carbide has a grain size of between about 0.1 and about 1.3 μm,
- the binder phase contains the metals W, Cr and Ta, dissolved in solid solution, and
- the at least one additional phase comprises a TaC phase visible by optical microscopy.

2. The sintered cemented carbide as claimed in claim 1, wherein the tungsten carbide has a grain size of between about 0.3 and about 0.6 μm.

3. The sintered cemented carbide as claimed in claim 1 wherein the sintered cemented carbide contains approximately 0.8 to 1.2 % Ta.

4. The sintered cemented carbide as claimed in claim 1 wherein the sintered cemented carbide contains up to 3 mass-% of the tungsten carbide is replaced by at least one hard component which is selected from the carbides, nitrides, carbonitrides, including their mixtures and solid solutions, of the metals Ti, Zr, Hf and Mo.

5. The sintered cemented carbide as claimed in claim 1 wherein up to 50 mass-% of the tantalum is replaced by niobium.

6. The sintered cemented carbide as claimed in claim 5, wherein the sintered cemented carbide contains approximately 0.4 to 0.6 % Nb, as related to the total mass of the sintered cemented carbide.

7. The sintered cemented carbide as claimed in claim 5 wherein the binder phase additionally contains Nb, dissolved in solid solution.

8. The sintered cemented carbide as claimed in claim 5 wherein at least one additional phase comprises a (Ta, Nb)C phase visible by optical microscopy.

9. The sintered cemented carbide as claimed in claim 1 wherein the binder phase forms about 3 to about 18 % of the total mass of the sintered cemented carbide.

10. The sintered cemented carbide as claimed in claim 9 wherein the binder phase contains up to about 20 % tungsten, as related to its mass and dissolved in solid solution.

11. The sintered cemented carbide as claimed in claim 9 wherein the sintered cemented carbide has a Cr content of from about 1 to about 40 %, as related to the total mass of the binder phase.

12. The sintered cemented carbide as claimed in claim 1 wherein the sintered cemented carbide additionally contains up to 8 % V, as related to the total mass of the binder phase.

13. The sintered cemented carbide as claimed in claim 12 wherein the binder phase contains at least about 2 % V.

14. The sintered cemented carbide as claimed in claim 12 wherein the binder phase additionally contains V, dissolved in solid solution.

15. The sintered cemented carbide as claimed in claim 12 wherein the at least one additional phase is visible by optical microscopy and comprises at least one of the (Ta, V)C and (Ta, Nb, V)C phases.

16. The sintered cemented carbide as claimed in claim 11 wherein the at least one additional phase comprises a (Cr, Co)-rich mixed carbide phase.

17. The sintered cemented carbide as claimed in claim 16 wherein the sintered cemented carbide contains approximately 17 to 30 % Cr, as related to the total mass of the binder phase.

18. The sintered cemented carbide as claimed in claim 11 wherein the sintered cemented carbide contains approximately 6 to 12 % Cr, as related to the total mass of the binder phase.

19. The sintered cemented carbide as claimed in claim 1 wherein the metals dissolved in the binder phase, with the exception of W, are dissolved in the binder phase in an amount corresponding to their respective solubility in the binder phase at room temperature.

20. The sintered cemented carbide as claimed in claim 1 wherein the sintered cemented carbide has a porosity of < A02.

21. The sintered cemented carbide as claimed in claim 1 further including a hard, wear-resistant coating applied by physical or chemical vapor deposition.

22. A cutting tool comprising a rake face and a flank face and comprising a cutting edge at the intersection of the rake face and the flank face, said cutting tool having a substrate wherein the substrate comprising a fine grained sintered cemented carbide containing chromium comprising a first phase based on tungsten carbide which is bound by means of a second phase of a metallic binder based on Co or CoNiFe, and of at least one additional phase comprising at least one carbide or mixed carbide of tantalum,

- the sintered cemented carbide contains approximately 0.3 to 4 % Ta, as related to the total mass of the sintered cemented carbide,
- the tungsten carbide has a grain size of between about 0.1 and about 1.3 μm,
- the binder phase contains the metals W, Cr and Ta, dissolved in solid solution, and

- the at least one additional phase comprises a TaC phase visible by optical microscopy.

23. The cutting tool as claimed in claim 22 wherein the cutting tool is one of a drill, a bit, a milling cutter, a part of such tools, a cutting insert and an indexable insert.

24. A process for manufacturing a sintered cemented carbide body comprising the steps of:

providing a starting powder mixture comprising tungsten carbide powder having a grain size between about 0.1 micrometers and about 0.8micrometers, a cobalt-containing powder, a tantalum-containing powder, and a chromium-containing powder;

pressing the starting powder mixture into a green compact; and

sintering the green compact to form the sintered cemented carbide body wherein the sintered cemented carbide body comprises a fine grained sintered cemented carbide containing chromium comprising a first phase based on tungsten carbide which is bound by means of a second phase of a metallic binder based on a cobalt-containing alloy and of at least one additional phase comprising at least one carbide or mixed carbide of tantalum, the sintered cemented carbide contains between about 0.3 to about 4 % Ta, as related to the total mass of the sintered cemented carbide, the tungsten carbide has a grain size of between about 0.1 and about 1.3 μm, the binder phase contains the metals W, Cr and Ta, dissolved in solid solution, and at least one additional phase comprises a tantalum carbide phase visible by optical microscopy.

25. The process for manufacturing a sintered cemented carbide body according to claim 24 wherein the cobalt-containing powder is selected from the group comprising one or both of cobalt and a cobalt-nickel-iron alloy.

26. The process for manufacturing a sintered cemented carbide body according to claim 24 wherein the tantalum-containing powder is selected from the group comprising one or more of tantalum or tantalum carbide or tantalum oxide.

27. The process for manufacturing a sintered cemented carbide body according to

claim 24 wherein the chromium-containing powder is selected from the group comprising one or more of chromium or chromium carbide or chromium oxide.

28. The process for manufacturing a sintered cemented carbide body according to claim 24 wherein the starting powder further including one or more of a vanadium-containing powder and a niobium-containing powder.

29. The process for manufacturing a sintered cemented carbide body according to claim 28 wherein the vanadium-containing powder is selected from the group comprising vanadium or vanadium carbide or vanadium oxide.

30. The process for manufacturing a sintered cemented carbide body according to claim 28 wherein the niobium-containing powder is selected from the group comprising one or more of niobium or niobium carbide or niobium oxide.

31. The process for manufacturing a sintered cemented carbide body according to claim 24 wherein the tantalum-containing powder comprises between about 0.3 percent and about 4 percent tantalum as related to the total mass of the sintered cemented carbide body.

32. The process for manufacturing a sintered cemented carbide body according to claim 31 wherein the starting powder includes a niobium-containing powder wherein the niobium replaces up to about 50 mass percent of the tantalum.

33. The process for manufacturing a sintered cemented carbide body according to claim 24 wherein the chromium-containing powder comprises chromium carbide in an amount corresponding to between about 1 percent and about 40 percent of the total mass of the cobalt-containing powder.

34. The process for manufacturing a sintered cemented carbide body according to claim 24 wherein the tungsten carbide powder being doped with one or more of chromium carbide and vanadium carbide.

35. The process for manufacturing a sintered cemented carbide body according to claim 34 wherein the tungsten carbide powder contains up to about 0.6 weight percent

chromium carbide.

36. The process for manufacturing a sintered cemented carbide body according to claim 24 wherein the tungsten carbide contains up to about 0.4 weight percent vanadium carbide.